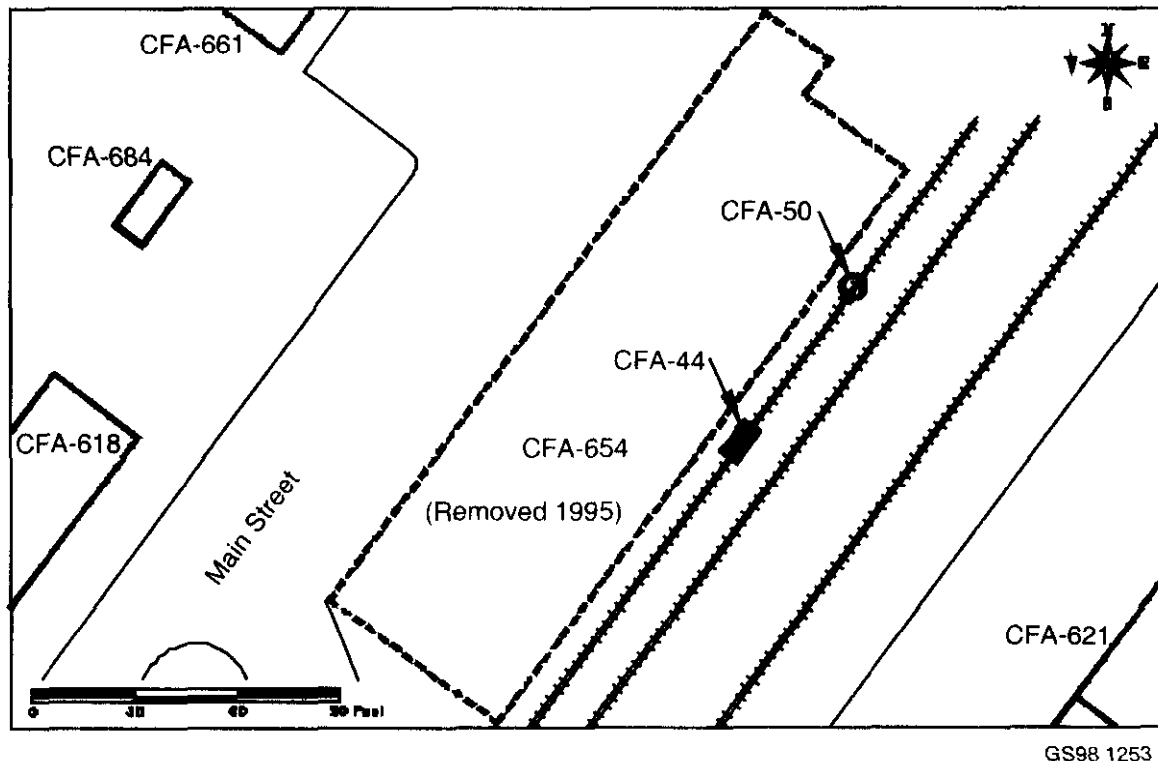


**4.1.6.3 Nature and Extent of Contamination.** The removal action consisted of removing soil contaminated with lead to a level below the 400 mg/kg lead screening level. Approximately 304 m<sup>3</sup> (400 yd<sup>3</sup>) of contaminated soil was excavated and shipped off-site to a treatment, storage and disposal facility. Sixty-five samples, representing post-removal verification samples, were submitted for total lead analysis. Sixty-four of the samples had total lead concentrations below the 400 mg/kg lead screening level. One of the 65, however, exceeded the total lead screening level of 400 mg/kg with a concentration of 650 mg/kg. This location was re-excavated and resampled for total lead. This verification sample result for the re-excavated area was below 400 mg/kg.

Post-removal verification analytical results for CFA-43 indicate that lead at the site is below the EPA (1994) lead screening level of 400 mg/kg and therefore has been adequately remediated (see Tables C-15 and C-16, Appendix C). Based on these results, CFA-43 is eliminated from further consideration in the BRA.

#### **4.1.7 OU 4-06 CFA-44 Spray Paint Booth Drain (CFA-654)**

**4.1.7.1 Site Summary.** This site consists of a drain outlet from a spray paint booth on the east side of Building CFA-654, where various types of paints such as epoxy, latex, and enamel were used (see Figure 4-11). These materials were used from 1952 to 1983. The spray booth used a water curtain system to scrub paint particles from the air before it was discharged to the atmosphere. Water was recycled through the system and reused in the water curtain. The water was treated using coagulants and



**Figure 4-11.** OU 4-06: CFA-44 Spray Paint Booth Drain (CFA-654).

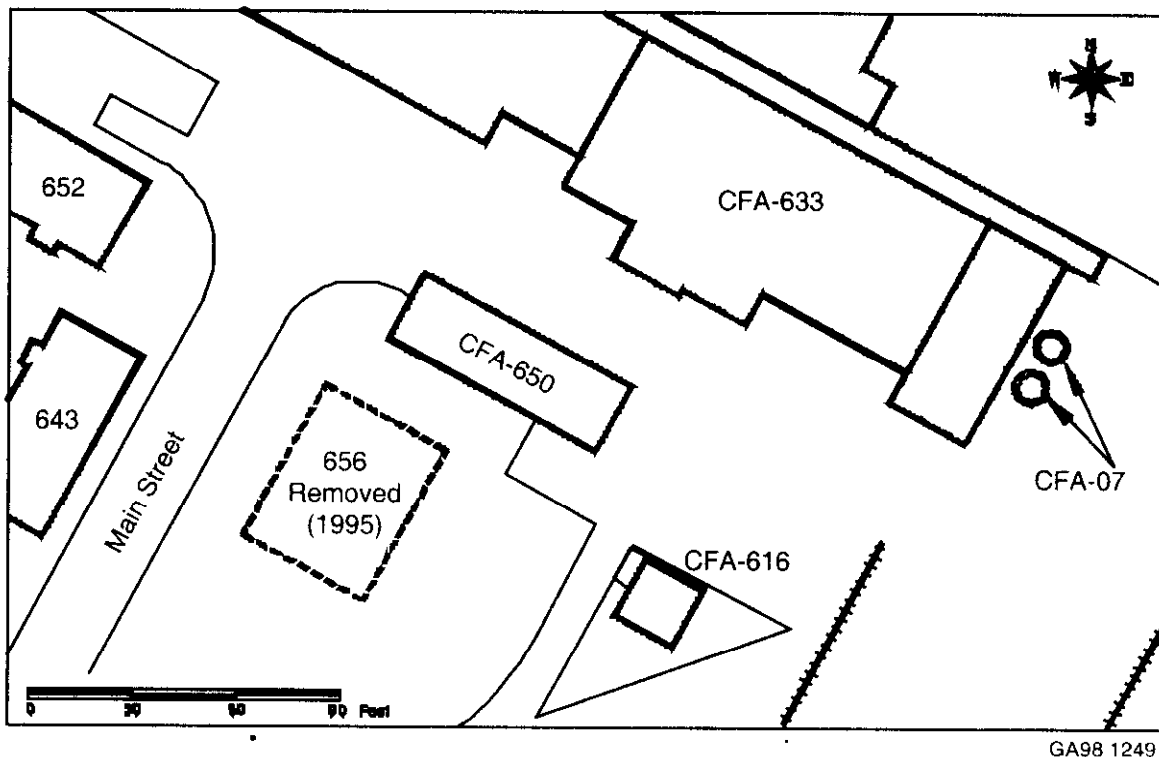
flocculants to settle out the solids, which were then collected in a sump and disposed in the CFA Landfill until disposal procedures were changed and the solids were disposed as hazardous waste. Treated wastewater without solids was discharged from the booth to the drain system and then onto the ground approximately once per month. Solvents containing VOCs in the paint booth ventilation air that would have been removed by the water curtain would also have been re-entrained and emitted to the atmosphere.

**4.1.7.2 Previous Investigations.** Contamination at the CFA-44 site was estimated, based on the Track 2 investigation, to extend over a 1 m<sup>2</sup> (1.2 yd<sup>2</sup>) area to a depth of approximately 1 m (3.3 ft). Screening samples were collected as part of the 1996 OU 4-06 time-critical removal action to determine whether total lead concentrations exceeded the EPA (1994) 400 mg/kg residential lead screening level. Five screening samples were collected from within the 1 m<sup>2</sup> (1.2 yd<sup>2</sup>) area for total lead analysis: three from the surface, one from approximately 1.2 m (4 ft) below ground surface (bgs), and one at basalt, approximately 4.5 m (15 ft) bgs. The analytical sample results indicate that the total lead concentrations at the CFA-44 site were less than the 400 mg/kg screening level (see Tables C-17 and C-18, Appendix C). Therefore, no further action was necessary at the site (Higgins 1997).

**4.1.7.3 Nature and Extent of Contamination.** Analytical results from the screening samples collected at CFA-44 indicate that lead at the site is below the EPA (1994) 400 mg/kg screening level. Therefore, CFA-44 is eliminated from further consideration in the BRA.

#### 4.1.8 OU 4-07: CFA-07 French Drains (CFA-633)

**4.1.8.1 Site Summary.** This site consisted of two french drains (commonly referred to as the north and south drains) located southeast of Building CFA-633 (see Figure 4-12). The french drains received laboratory wastewater from 1951 to 1984, via inflow pipes from a laboratory in the southwest corner of



**Figure 4-12.** OU 4-07: CFA-07 French Drains E/S (CFA-633).

Building CFA-633. The wastes typically consisted of acids and bases with low levels of radioactivity. There is no indication that large quantities of chemicals were released to the drains, and the laboratory did not keep records of the quantities of waste discharged.

**4.1.8.2 Previous Investigations.** A Track 1 investigation (DOE 1994a) was completed in October 1994 to gather historical, empirical, and process data for the CFA-07 french drains. The Track 1 decision indicated that CFA-07 be further investigated under the Track 2 process. As part of the Track 2 investigation, the north and south drains were removed in August 1995 (Gianotto et al. 1996). At the north drain, all of the drain structure and discolored soil encountered during the removal were excavated, resulting in a 3.7 m (12 ft) deep excavation. At the south drain, radioactively contaminated soil was encountered at approximately 3 m (10 ft). Excavation continued, and the drain structure and soil were excavated to a depth of approximately 3.9 m (13 ft). Excavation was stopped at this depth for the following reasons:

- All of the materials associated with the drain structure had been removed,
- The depth of the excavation was in excess of 10 ft bgs.
- The lateral extent of contamination at depths less than 13 ft bgs had been determined.
- The levels of radioactivity being detected were relatively low.

Data from verification samples was modeled using GWSCREEN (Version 2.02) (Rood 1993) to determine the potential risk to groundwater receptors as part of the Track 2 Investigation. The model results indicated that arsenic posed a potential carcinogenic risk of  $3\text{E-}06$ , which is within the acceptable risk range. It was also determined that lead was present at 13 to 13.5 ft bgs in concentrations ranging from 1,460 to 4,580 mg/kg, which is above the EPA screening level of 400 mg/kg.

Track 2 verification soil sampling was performed at the CFA-07 south drain on August 1, 1995. The first sample, from the south drain, was collected from a depth of 3.9 to 4.1 m (13 to 13.5 ft) bgs on the west side of the excavation directly below where the drain was removed. The second and third samples were collected from the same depth from the east and north sides of the excavation floor, respectively. Samples were analyzed for gamma spectroscopy, Am-241, Sr-90, U isotopes, Pu isotopes, metals, and SVOCs.

Track 2 verification sampling at the CFA-07 north drain was performed in August, 1995. Three verification samples were collected from the excavation floor below where the drain had been removed at a depth of approximately 3.7 m (12 ft) bgs. Samples were analyzed for the same suite of analytes as the south drain. The analytical results indicate that antimony, chromium, copper, lead, mercury, selenium, and silver concentrations were elevated over background levels in one or more of the samples collected from the south drain excavation. Arsenic, chromium, copper lead, mercury, and silver concentrations were elevated over background levels in one or more of the samples from the north excavation. Lead concentrations in the south drain excavation and chromium concentrations in both drains were particularly elevated. Chrysene, bis(2-ethylhexyl)phthalate, and di-n-butyl phthalate were the only SVOCs detected in the samples; all detections were at low concentrations (i.e., below residential soil risk-based screening concentrations of 8.77 mg/kg, 45.7 mg/kg, and 27,000 mg/kg, respectively) (DOE-ID 1997).

The verification data indicate that the following radionuclides were elevated above background. Pu-238, Pu-239/240, Am-241, and Cs-137. Pu-238 was detected in one of the two samples collected

from the south drain excavation. Activities ranged from 4.8 to 9.3 pCi/g in the north drain soils. Pu-239 or 240 (the analysis does not distinguish between the two isotopes), Am-241, and Cs-137 were detected in all six of the samples collected. Activities of Pu-239/240, Am-241, and Cs-137 ranged from 0.78 to 3.1 pCi/g, 0.12 to 0.34 pCi/g, and 26.3 to 104 pCi/g, respectively. Co-60 and Ag-108m were also detected at low activities (i.e., from 0.13 to 3.6 pCi/g and from 0.29 to 0.43 pCi/g, respectively), primarily in the samples from the CFA-07 north drain.

**4.1.8.3 Nature and Extent of Contamination.** The initial contaminant screen presented in the RI/FS Work Plan eliminated various metals, SVOCs, and radionuclides from further evaluation. The results of the supplemental contaminant screen, presented in Table C-19, Appendix C, also indicate that arsenic is within the range of background concentrations for INEEL soils. Arsenic is therefore eliminated as a COPC. Based on these contaminant screens, the COPCs at CFA-07 retained for further evaluation are: lead, Ag-108m, Cs-137, and Pu-238. The range of detected concentrations of these COPCs is as follows:

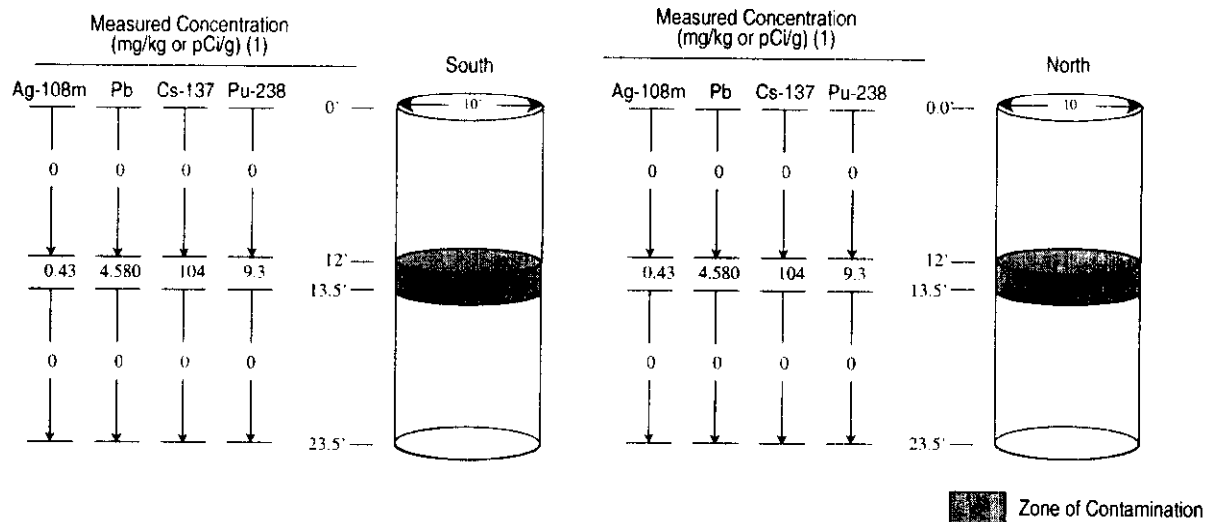
|         |                    |
|---------|--------------------|
| Lead    | 74 to 4.580 mg/kg  |
| Ag-108m | 0.29 to 0.43 pCi/g |
| Cs-137  | 26.3 to 104 pCi/g  |
| Pu-238  | 0.08 to 9.3 pCi/g  |

Measured concentrations indicate that subsurface soils [3.7 m (12 ft) bgs from the north drain and 3.96 to 4.1 m (13 to 13.5 ft) bgs at the south drain] at CFA-07 are contaminated with lead and radionuclides (i.e., Ag-108m, Cs-137, Pu-238). Basalt was not encountered during the removal action. It is assumed that the downward mobility of metals and radionuclides suspended in liquids in the vadose zone (i.e., waste water) is approximately 3.0 m (10 ft) (DOE 1997). Therefore, contamination is assumed to exist in CFA-07 soils from 3.7 to 7.1 m (12 to 23.5 ft) bgs. This assumption is made to ensure that potential risks from exposures at CFA-07 are not underestimated (Section 6). This assumption is conservative because sample results are not available for depths greater than 4.1 m (13.5 ft) bgs; however, the entire 3.7 to 7.2 m (12 to 23.5 ft) soil interval is assumed to be contaminated.

In summary, the extent of contamination at the site begins at 3.7 m (12 ft) bgs, extends to 7.2 m (23.5 ft) bgs, and encompasses the area of CFA-07, approximately 14.6 m<sup>2</sup> (17.5 yd<sup>2</sup>) (Figure 4-13). The volume of soil assumed to be associated with the contamination at CFA-07 is 51 m<sup>3</sup> (66.7 yd<sup>3</sup>). Based on the contaminant screening results and the nature and extent of the COPCs detected in subsurface soils at CFA-07, the site is retained for further evaluation of cumulative risk associated with the groundwater pathway. The summary statistics for the CFA-07 COPCs, based on the contaminant screening process are shown on Tables C-20 and C-21, Appendix C. Figure 4-13 shows the assumptions for the nature and extent of contamination and source-term estimates that are used to evaluate cumulative risk associated with the groundwater pathway in Section 6 of this BRA.

#### **4.1.9 OU 4-07: CFA-12 French Drains (2) (CFA-690)**

**4.1.9.1 Site Summary.** This site consists of two french drains (commonly referred to as the north and south french drains) located east of the north corner of Building CFA-690, which housed several laboratories and offices operated by the DOE Radiological and Environmental Sciences Laboratory (RESL) (see Figure 4-14). The french drains were unlined concrete cylinders approximately 0.6 m (2 ft) in diameter. The bottom of the drains were 1.8 m (6 ft) bgs. Process knowledge indicates that the types



| Receptors/Pathways and Calculated Exposure Point Concentrations |       |                  |          |
|---|-------|------------------|----------|
| Receptor/Pathway  | Units | Depth (ft)       | Lead     |
| Occupational / Air  | mg/kg | 0 - 0.5 (1)      | 0.00E+00 |
| Occupational / External Radiation                               | mg/kg | 0 - 4 (2)        | 0.00E+00 |
| Residential / All   | mg/kg | 0 - 10 (2)       | 0.00E+00 |
| Residential / Groundwater                                       | mg/kg | 12 - 23.5 (2)(3) | 4.58E+03 |

| Receptors/Pathways and Calculated Exposure Point Concentrations |       |                  |          |          |          |
|---|-------|------------------|----------|----------|----------|
| Receptor/Pathway  | Units | Depth (ft)       | Ag-108m  | Cs-137   | Pu-238   |
| Occupational / Air  | PCi/g | 0 - 0.5 (1)      | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Occupational / External Radiation                               | PCi/g | 0 - 4 (2)        | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Residential / All   | PCi/g | 0 - 10 (2)       | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Residential / Groundwater                                       | PCi/g | 12 - 23.5 (2)(3) | 4.30E-01 | 1.04E+02 | 9.30E+00 |

#### Assumptions:

Site was excavated to approximately 3.7 m (12 ft) and backfilled.

The assumed maximum depth of contamination (i.e., 7.2 m [23.5 ft]) is based on the conservative assumption that the downward mobility of chemicals detected in the vadose zone at CFA-07 is 3.0 m (10 ft). Positive detections of COPCs in the vadose zone are reported no deeper than 4.1 m (13.5 ft).

#### Notes:

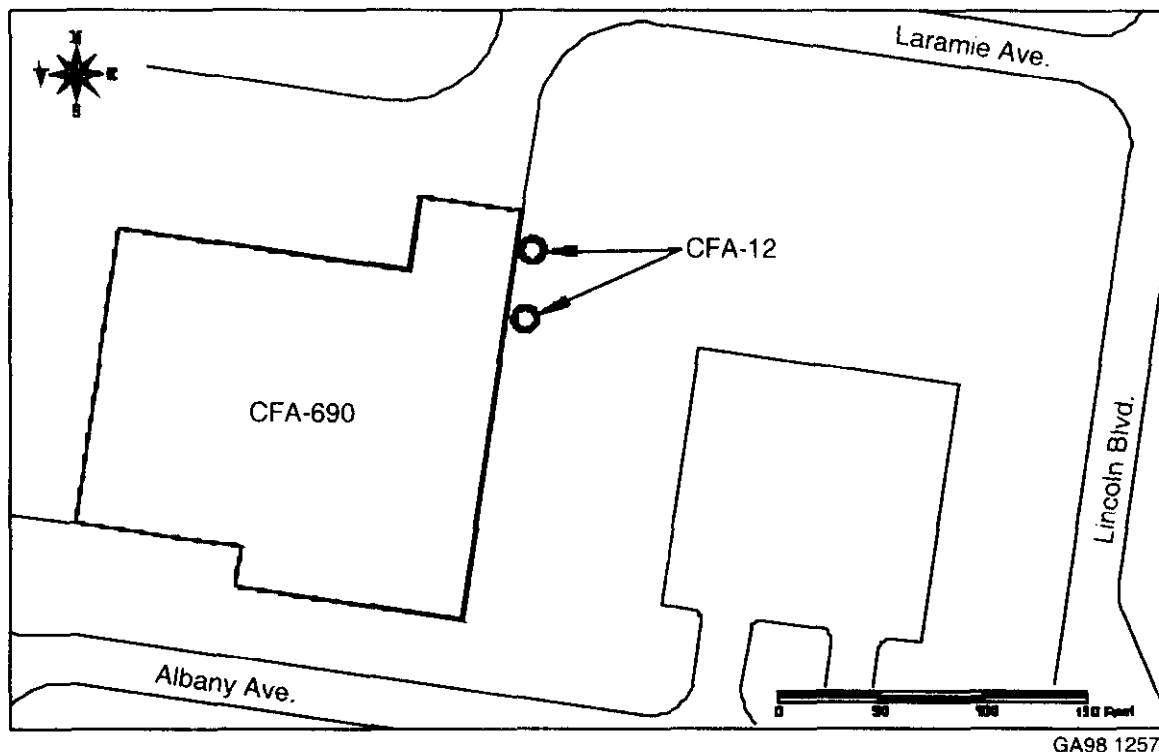
- (1) Exposure point concentrations shown for this depth interval represent the 95% lognormal UCL (95 UCL) or maximum detected concentration, whichever is less, for analytical data collected at the site.
- (2) Exposure point concentrations (EPC) shown for this depth interval represent volume-weighted concentrations, and are calculated using the following equations:

| Depth (ft) | EPC Equation   |
|------------|--|
| 0-4        | $[(C_{0-0.5})(0.5) + (C_{0.5-4})(3.5)]/4$                  |
| 0-10       | $[(C_{0-0.5})(0.5) + (C_{0.5-4})(3.5) + (C_{4-10})(6)]/10$ |
| 12-23.5    | $C_{>10'}$   |

Where: C=95 UCL or maximum detected concentration, whichever is less, for the indicated depth interval.

COPCs are only detected from 3.7 to 4.1 m (12 to 13.5 ft). Exposure point concentrations for the residential groundwater pathway are based on measured concentrations from this depth interval.

**Figure 4-13.** OU 4-07: CFA-07 nature and extent assumptions.



**Figure 4-14.** OU 4-07: CFA-12 French Drains (2) (CFA-690) (south drain only).

of waste disposed in the drains via sink in the laboratory included dilute acids, containing low levels of radioactivity. Use of the sinks was discontinued in 1984, and the floor drains were capped inside the building.

**4.1.9.2 Previous Investigations.** A Track 1 investigation (DOE 1994b) was completed in October 1994 to gather historical, empirical, and process data from the CFA-12 french drains (Gianotto et al. 1996). Soil samples collected from both drains were analyzed for metals and radionuclides. Several metals were detected in both drains above background concentrations. The results of the radiological analyses indicate that only the south drain was radiologically contaminated.

Table 4-1 of the OU 4-09 Track 2 Summary Report (Gianotto et al., 1996) shows that the 1993 sampling of the drain sediments produced maximum detections of cadmium, calcium, mercury, and lead that exceeded INEEL background concentrations. At the time the drains were removed, these relatively low concentrations were not considered to be significant, so the post removal action samples were not tested for metals. All of the metal contamination that was detected in the 1993 sampling was removed with the drains, but there is a small chance that low levels of metal contamination still exist in the basalt beneath the drains.

On the basis of these results, it was decided to further investigate the site in a Track 2 investigation in conjunction with a removal action. The goal of the investigation was to (1) determine if past disposal to the drains resulted in actual or potential risks to receptors (Blackmore 1995), (2) to characterize soil contamination beneath the drains and (3) determine the proper method(s) for disposal and/or treatment of contaminated materials.

The removal action was performed in July 1995, concurrent with the OU 4-09 Track 2 investigation (Gianotto et al. 1996). Soil was removed to a depth of approximately 2.4 m (8 ft). Following the removal of the two drains, verification samples were collected to determine contaminant levels. Verification samples from the north french drain were analyzed for VOCs, SVOCs, pesticides, and PCBs. The only contaminant detected in the north french drain was pentachlorophenol at a concentration of 190 ug/kg. Results of the contaminant screening presented in the RI/FS Work Plan indicate that pentachlorophenol is below the risk-based concentration of 5.73 mg/kg. As a result, the north french drain was screened from further evaluation.

Verification samples at the south french drain were collected at 2.6 m (8.5 ft) bgs from a subsurface basalt fracture and were analyzed for SVOCs, gamma spectroscopy, and alpha/beta isotopes. Several radionuclides detected in the soil samples collected from the south drain excavation were slightly above background concentrations. These elevated radionuclide activities were detected in a subsurface basalt fracture located northeast of the south french drain. Remaining contamination at the site is in the basalt.

**4.1.9.3 Nature and Extent of Contamination.** The initial contaminant screen presented in the RI/FS Work Plan eliminated SVOCs and several radionuclides from further evaluation. The results of the supplemental contaminant screen presented in Table C-22 of Appendix C indicates that Ag-108m, Am-241, Ba-133, Cs-137, Eu-152, U-235, and U-238, should be retained for further evaluation in the RI/BRA. The detection frequency for Ag-108m, Am-241, Ba-133, Cs-127, Eu-152, U-238, is 100 percent. U-235 was detected in 50 percent of the samples. The range of detected concentrations is as follows:

|         |  |
|---------|--|
| Ag-108m | 2.46 pCi/g (only one positive detection is reported) |
| Am-241  | 0.09 to 23.7 pCi/g                                   |
| Ba-133  | 0.77 pCi/g (only one positive detection is reported) |
| Cs-137  | 10.2 to 1,070 pCi/g                                  |
| Eu-152  | 10.6 pCi/g (only one positive detection is reported) |
| U-235   | 1.2 to 2.4 pCi/g                                     |
| U-238   | 0.8 to 18.3 pCi/g                                    |

The Track 2 measured concentrations indicate that subsurface soils [2.6 m (8.5 ft) bgs] at the south drain of CFA-12 are contaminated with low levels of radionuclides (i.e., Ag-108m, Am-241, Ba-133, Cs-137, Eu-152, U-235, U-238).

Excavation of contaminated soils from 0 to 2.6 m (0 to 8.5 ft) bgs was conducted in July 1995. The soils in this depth interval are clean because they have been backfilled with clean soil. The extent of contamination at the site exists at 2.6 m (8.5 ft) bgs (the depth at which basalt was encountered), and encompasses the area of the CFA-12 south drain (approximately 13.4 m<sup>2</sup> [16.0 yd<sup>2</sup>]). Because soils at CFA-12 have been remediated and the area backfilled with clean soil, the residual contamination, which is present at 2.6 m (8.5 ft) bgs, occurs in the basalt. The volume of soil associated with contamination bgs at CFA-12 is assumed to extend from 0 to 2.6 m (0 to 8.5 ft) and is 35 m<sup>3</sup> (45.8 yd<sup>3</sup>) for the future residential risk evaluation (Section 6). Although contamination does not exist from the surface to basalt, the entire interval is evaluated due to a potential excavation of soils for a future residential scenario. This

assumption is made to ensure that potential risks from exposures to CFA-12 are not underestimated (Section 6). This assumption is conservative because sample results are not available for depths greater than 2.6 m (8.5 ft) bgs; however, the entire 0 to 2.6 m (0 to 8.5 ft).

The summary statistics for the CFA-12 COPCs, based on the contaminant screening, are shown in Tables C-23 and C-24, Appendix C. Figure 4-15 shows the assumptions for the nature and extent of contamination and source-term estimates (i.e., exposure point concentrations) that are used to evaluate potential risks associated with the site.

#### **4.1.10 OU 4-08: CFA-08 Sewage Plant (CFA-691), Septic Tank (CFA-716), Drainfield and CFA-49 Hot Laundry Drain Pipe**

OU 4-08 consists of potential releases from the components of the Sewage Treatment Plant (STP), the septic tank, the pumping station, the drainfield, existing and abandoned lines from the pumping station to the drainfield, the abandoned sludge drying bed that was a part of the Navy sewer system at CFA, the perched water residue in sedimentary interbeds below and adjacent to the drainfield, and surface soils downwind of the CFA-08 sewer system and drainfield.

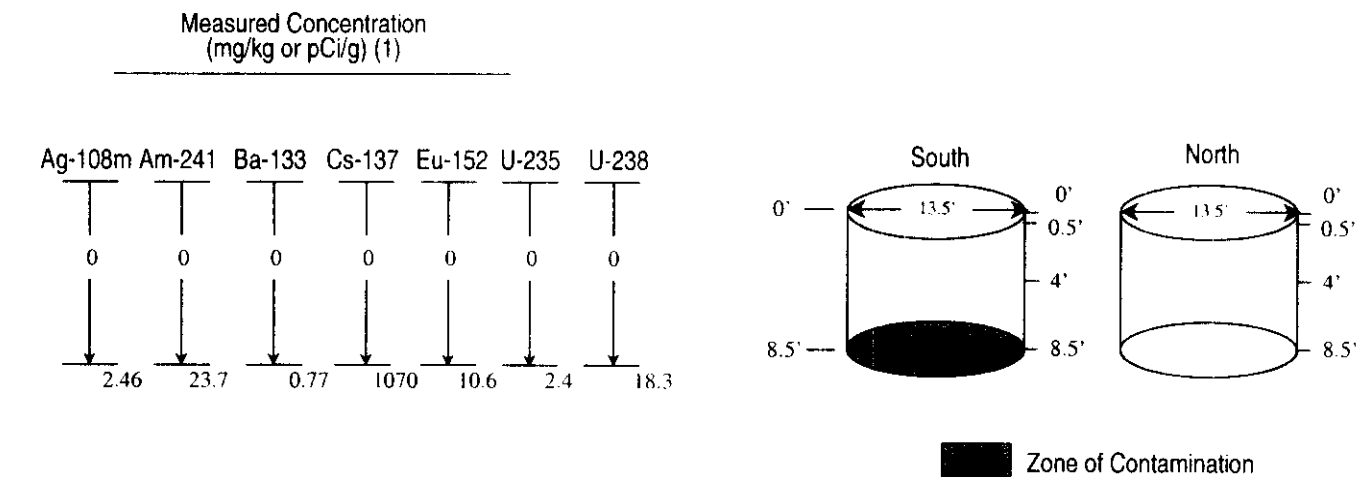
**4.1.10.1 Site Summary:** The CFA-08 drainfield is located approximately 450 m (1,476 ft) northeast of the STP (see Figure 4-16). The dimensions of the drainfield are 61 × 305 m (200 × 1,000 ft). It consists of five distribution areas (DAs), each with a distribution box and 20 distribution lines. The drainfield distribution lines are made of concrete drain tiles that lie approximately 1.0 m (3.5 ft) bgs. The first two drainfields were installed as part of the Navy's sewer system and were in operation since 1944. Two additional DAs were installed as part of the new sewer system in 1953, and a fifth DA was added in 1961 (EG&G 1988). Based on process knowledge, the CFA-08 drainfield received wastewater containing radiological and other effluent.

When the fifth DA was added to the drainfield in 1961, the original two 10-cm (4 in) pipelines between the pumping station and the drainfield were capped and abandoned in place. The pipelines were replaced with a new 20-cm (8-in) trunk line and feeder lines going to each of the distribution boxes and drainfield batteries. Two influent pipelines connect south of the STP, and a single influent line extends to the STP. To accommodate overflow, a pipeline ran from the adjoining influent lines to the CFA-716 septic tank (Evans, 1995).

The CFA-08 STP was used to treat and dispose of CFA process wastewaters from 1953 to 1995 (see Figure 4-16). The original system, installed by the Navy in 1944, handled wastewaters until 1953. The original Navy system was upgraded in 1953 to include a pump station, trickling filters, and a digester. The Navy plant is presumed to have handled only sanitary wastewater until 1950, when the original hot laundry was built. The hot laundry processed clothing contaminated with low-levels of radionuclides. The wastewater from this process was discharged directly from the plant. CFA-49 consists of an abandoned hot laundry drain pipe located at CFA-669 (Old Hot Laundry). The STP received effluent from the hot laundry via the laundry drain pipe until the drain pipe was abandoned in place 1980 (Stormberg et al. 1996). The STP was deactivated in 1995. The abandoned line from the hot laundry to the STP was removed during D&D of the hot laundry and was not evaluated as part of the OU 4-08 Track 2 investigation.

Perched water zones were created by the drainfield as were in existence as recently as 1995 when the drainfield was deactivated. The zones were investigated as part of the Track 2 investigation conducted in 1995. Two subsurface borings were completed to a depth of 31.3 m (102.7 ft) bgs on the





| Receptors/Pathways and Calculated Exposure Point Concentrations |       |               |          |          |          |          |          |          |          |
|---|-------|---------------|----------|----------|----------|----------|----------|----------|----------|
| Receptor/Pathway  | Units | Depth (ft)    | Ag-108m  | Am-241   | Ba-133   | Cs-137   | Eu-152   | U-235    | U-238    |
| Occupational / Air  | PCi/g | 0 - 0.5 (1)   | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Occupational / External Radiation                               | PCi/g | 0 < 8.5 (2)   | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Residential / All   | PCi/g | 0 - 8.5 (2,3) | 2.89E-01 | 2.79E+00 | 9.06E-02 | 1.26E+02 | 1.25E+00 | 2.82E-01 | 2.15E+00 |

#### Assumptions:

Site was excavated to 2.4 m (8 ft) and backfilled.

The assumed maximum depth of contamination (i.e., 2.6 m [8.5 ft]) is based on positive detections of COPCs in the vadose zone reported no deeper than 2.6 m (8.5 ft). It is assumed that COPCs will not migrate downward beyond 2.6 m (8.5 ft) due to the presence of basalt at 2.4 m (8 ft). It is also assumed that COPCs may occur from 0 to 2.6 m (0 to 8.5 ft) for the future residential scenario as a result of excavation activities.

#### Notes:

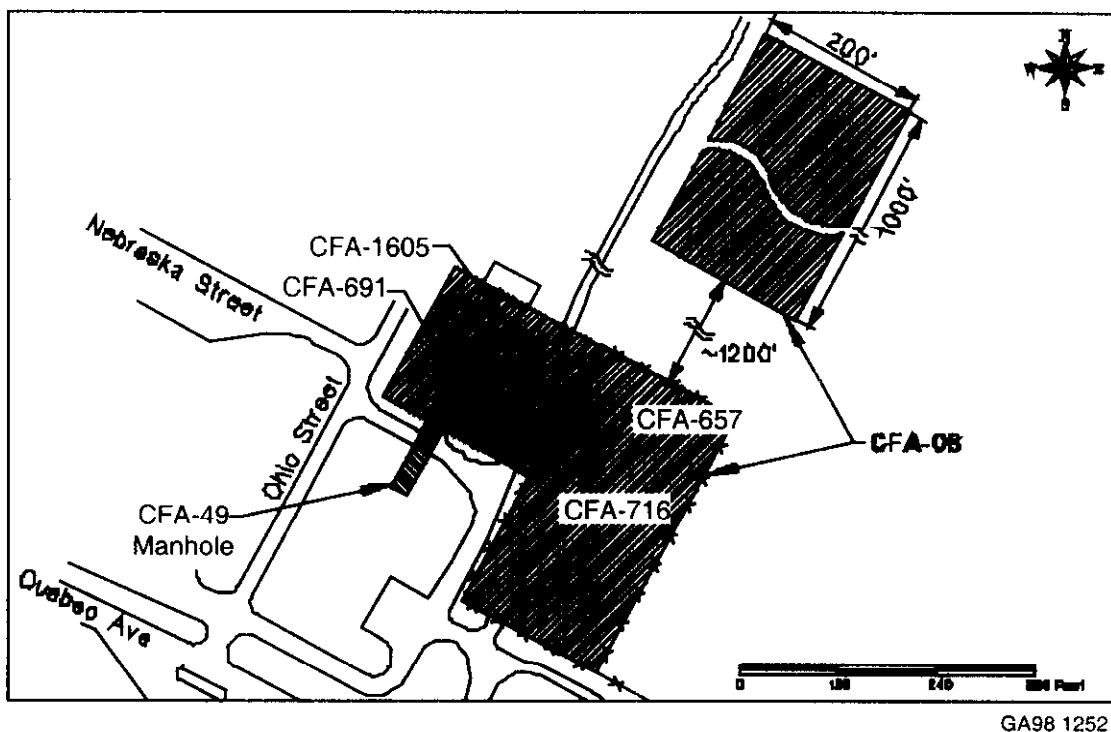
- (1) Exposure point concentrations shown for this depth interval represent the 95% lognormal UCL (95 UCL) or maximum detected concentration, whichever is less, for analytical data collected at the site.
- (2) Exposure point concentrations (EPC) shown for this depth interval represent volume-weighted concentrations, and are calculated using the following equations:

| Depth (ft) | EPC Equation                              |
|------------|---|
| 0-4        | $[(C_{0-0.5})(0.5) + (C_{0.5-4})(3.5)]/4$ |
| 0 - < 8.5  | $[(C_{0-0.5})(0.5) + (C_{0.5-4})(8)]/8.5$ |
| 0-8.5      | $(C_{4-10})/8.5$                          |

Where: C=95 UCL or maximum detected concentration, whichever is less, for the indicated depth interval

COPCs are only detected at 2.6 m (8.5 ft). Exposure point concentrations for the residential groundwater pathway are based on measured concentrations from this depth.

**Figure 4-15.** OU 4-07: CFA-12 nature and extent assumptions.



**Figure 4-16.** OU 4-08: CFA-08 Sewage Plant (CFA-691), Septic Tank (CFA-716), Drain Field, and CFA-49 Hot Laundry Drain Pipe.

east and west sides of the drainfield. The first saturated zone was located at a depth of 45.7 m (150 ft) bgs on the west side of the drainfield. The deeper zone was encountered at a depth of 31.3 m (102.7 ft). No perched water was encountered on the eastside. Five boreholes were also drilled within the drainfield to depths ranging from 5.8 m (19 ft) to 8.2 m (27 ft) bgs. Perched water was encountered at four of the five discharge areas. Water samples were collected from boreholes drilled into the zones where it was encountered.

Data from samples collected during the Track 2 Investigation indicate low concentrations of heavy metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver); however, none were above toxicity characteristic leaching procedure (TCLP) limits for the characteristic of toxicity (C. E. Klassy and A. F. Brown, D&D Characterization and Decision Analysis Report for the Central Facilities Area Sewage Treatment Plant, INEL-96/0360, Rev 0, June 1997). No TCLP VOCs or SVOCs were identified in the RCRA TCLP limits allowed in 40 Code of Federal Regulations (CFA) 261.24 for the toxicity characteristic. No TCLP VOCs or SVOCs were identified in any borehole samples. A hazardous waste determination (HWD), which used process knowledge and personnel interviews, determined that the waste materials did not qualify as RCRA Listed waste. Samples analysis detected only low levels of PCB contamination in the septic tank (CFA-716) and none in any of the borehole samples. The Toxic Substances Control Act (TSCA) regulatory limit for PCBs is 50 ppm; the highest PCB concentration of any sample in the septic tank was 4.2 ppm, and a HWD revealed that no solvents or PCB containing materials had access, or were intentionally disposed of or spilled to any sump, drain, etc., tied to the CFA STP. Therefore, the septic tank waste is not regulated by TSCA. Pesticide and herbicide contamination of the septic system was also below regulatory levels (Reference: M. D. Jorgensen, Environmental Affairs, Hazardous Waste Determination-CFA Sewage Treatment Plant Decontamination and Dismantlement, OU 4-13. "Sampling and Removal Action Activities," May 1, 1997).

**4.1.10.2 Previous Investigations:** The CFA-08 drainfield, abandoned Navy drying beds, perched water in sedimentary interbeds below and adjacent to the drainfield, and surface soils downwind of the CFA-08 sewer system and drainfield were evaluated in the OU 4-08 Track 2 investigation in 1994. Samples were collected from the drainfield as part of the OU 4-08 Track 2 investigation and were analyzed for radionuclides, metals, VOCs, SVOCs, PCBs, pesticides, and herbicides. Analytical results indicated radionuclides, metals, PCBs, VOCs, and SVOCs were present in the drainfield soils. Metals in the soil samples collected from the Navy drying bed were below background soil concentrations. Other tentatively identified compounds were detected in the analysis. The data for the unidentified compounds above 400 ug/kg were evaluated. The compounds identified in this evaluation include methyl isobutyl ketone, olefin and olefin isomers, alkyl esters of organic acids (compounds commonly found in various foods and fruits), 2,3,4-tribromophenol (surrogate compound used in laboratory analyses) and methyl acetate. Soil samples were analyzed for all of the contaminants detected in the perched water, except tritium. Chloromethane was the only VOC detected in perched water, after contaminant screening and was not detected in the soil. Perched water occurred in sedimentary interbeds below and adjacent to the drainfield. Chloromethane would typically be present in the wastewater and would readily escape as a gas when exposed to atmospheric conditions. In this case, it was captured in the perched water sample(s) but was not present in the soil due to its volatility. The metals detected on the perched water were arsenic, barium, lead, manganese and zinc. The concentrations of the trace metals arsenic and barium are below MCLs. There are no established background concentrations or MCLs for manganese and zinc. A radiological survey performed in 1994 indicated no surface soil contamination above background at areas downwind of the plant and drainfield.

Radionuclides detected in the perched-water samples include Am-241, Cs-137, Pu-238, Pu-239/240, Sr-90, tritium, U-234, and U-238. Sr-90 was detected in all samples above the MCL of 0.008 pCi/mL (8 pCi/L). The highest concentrations of Sr-90 were detected in the first two sampling rounds of DA 1 shallow well samples and had concentrations of 137 ( $\pm 2.0$ ) and 55 ( $\pm 1$ ) pCi/L. Total uranium (U-234, U-235, and U-238) MCLs are not available; however, the total uranium concentrations for OU 4-08 samples exceeded the background concentrations for total uranium. Tritium concentrations were below the MCLs in all samples. Pu-238, Pu-239/240, Cs-137, and Am-241 were detected only in shallow drainfield levels (18–29 ft). The MCLs for Am-241, Cs-137, Pu-238 and Pu-239/240 have not been established.

The results of the Track 2 investigation indicated that the abandoned Navy sludge drying beds could be eliminated from further evaluation because no chemicals of concern were identified following the data evaluation and screening. The investigation also concluded that the soils downwind of the STP and drainfield did not require further sampling and evaluation because the 1994 EM radiological survey indicated no surface soils were contaminated above background levels (Evans et al. 1995).

As discussed in the OU 4-13 RI/FS Work Plan, data gaps in the nature and extent of contamination from the drainfield and components of the STP exist (LMITCO 1997). The drainfield and STP (including the CFA-49 abandoned hot laundry drainpipe that discharge to the STP) are therefore retained for further evaluation in this BRA.

The CFA-08 drainfield, pipelines, and STP are evaluated as three separate CFA-08 sites in this RI/BRA because each of these CFA-08 components is located in a distinct area of CFA-08. Separation of CFA-08 into three sites also allows for a more site-specific delineation of the nature and extent of contamination at CFA-08; that is, COPCs are identified specifically for the drainfield, pipeline, and STP. This approach will enable any further action required for CFA-08 to be focused specifically on the drainfield, pipeline, or STP.

The following sections present the results of the supplemental contaminant screening for the CFA-08 drainfield, pipeline, and STP, and describe the nature and extent of contamination at each of these CFA-08 sites.

**4.1.10.3 CFA-08 Drainfield Nature and Extent of Contamination:** The initial contaminant screen presented in the RI/FS Work Plan identified Aroclor-1254, Aroclor-1260, arsenic, carbazole, isophorone, Am-241, Co-60, Cs-137, Eu-152, Eu-154, Pu-239/240, and U-235 as COPCs for CFA-08 and Co-60, Ra-226, and U-235 as COPCs for CFA-49. The COPCs identified in the Work Plan for CFA-08 were selected on a site-wide basis (i.e., COPCs were not selected separately for the drainfield, pipeline, and STP). The COPCs identified for CFA-08 in the Work Plan were assumed to be preliminary COPCs for the drainfield, pipeline, and the STP. Preliminary COPCs for the CFA-08 STP also assumed to include Ra-226, which was identified in the Work Plan as a COPC for CFA-49.

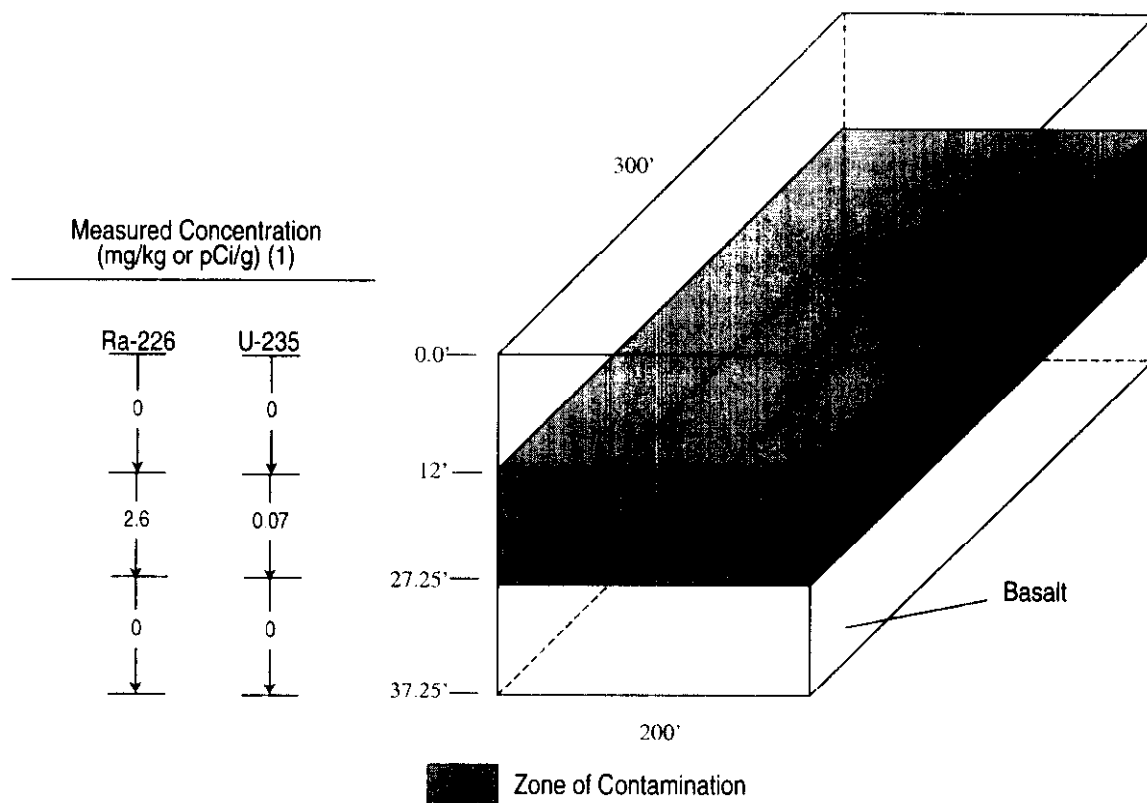
The results of the supplemental contaminant screen, presented in Table C-25, Appendix C, indicate Aroclor-1254, Cs-137, Pu-239/240, and U-235 are retained for further evaluation in the RI/BRA. Detected concentration of arsenic are not source related and are assumed to be within the range of background concentrations for INEEL soil. Arsenic is therefore eliminated as a COPC. Cs-137 was detected in 72.3 percent of 65 samples in concentrations ranging from 0.0795 to 180 pCi/g. Pu-239/240 was detected from 0.07 to 2.9 pCi/g, and U-235 from 0.031 to 0.44 pCi/g.

Data collected from 1994 to 1997 indicate that soils overlying the basalt are contaminated with Cs-137, Pu-239/240, and U-235. Although, actual basalt depths range from 6.1 to 9.9 m (20 to 32.4 ft), the assumed depth for the risk assessment is 9.9 m (32.4 ft). This assumption ensures that potential risks are not underestimated because the volume of contaminated soil is greater than actual.

The extent of contamination is assumed to encompass the entire drainfield (approximately 18,605 m<sup>2</sup> [22,252 yd<sup>2</sup>]). The volume of soil associated with the contamination at the CFA-08 drainfield is 184,189.5 m<sup>3</sup> (240,000 yd<sup>3</sup>) (Figure 4-17) (Evans et al. 1995). The summary statistics for the CFA-08 drainfield COPCs, are shown in Tables C-26 and C-27, Appendix C. Figure 4-17 shows the assumptions for the nature and extent of contamination, source-term estimates, and exposure point concentrations used to evaluate potential risks associated with the site

**4.1.10.4 CFA-08 Pipeline Nature and Extent of Contamination:** The supplemental contaminant screen for the CFA-08 Pipeline, presented in Table C-28 of Appendix C, indicates that all of the Work Plan COPCs were eliminated from further evaluation in the BRA. Of the Work Plan COPCs, Aroclor-1254, Aroclor-1260, arsenic, Cs-137, and U-235 were all below screening levels; Am-241, Co-60, Eu-152, and Eu-154 were not detected; and carbazole, isophorone, and Pu-239/240 were not sampled. Detected concentrations of arsenic are not source related and are assumed to be within the range of background concentrations for INEEL soil. Arsenic is therefore eliminated as a COPC. Based on these results, the CFA-08 Pipeline is eliminated from further consideration in the BRA.

**4.1.10.5 Sewage Treatment Plant Nature and Extent of Contamination:** Under the D&D Program, subsurface soil samples were collected in the vicinity of the STP. Subsurface samples were analyzed for inorganics, metals, herbicides, PCBs, radionuclides, VOCs, and SVOCs. The results of the supplemental contaminant screen, (see Table C-30, Appendix C), indicate Ra-226 and U-235 are retained for further evaluation in the RI/BRA. Detected concentrations of arsenic are not source related and are assumed to be within the range of background concentrations for INEEL soil. Arsenic is therefore eliminated as a COPC. Ra-226 was detected in 100 percent of 13 samples and U-235 was detected in 73.1 percent of 26 samples. The range of detected concentrations of Ra-226 was 1.25 to 3.04 pCi/g; and U-235, 0.0195 to 0.232 pCi/g.



| Receptors/Pathways and Calculated Exposure Point Concentrations |       |                  |          |          |
|---|-------|------------------|----------|----------|
| Receptor/Pathway  | Units | Depth (ft)       | Ra-226   | U-235    |
| Occupational / Air  | PCi/g | 0 - 0.5 (1)      | 0.00E+00 | 0.00E+00 |
| Occupational / External Radiation                               | PCi/g | 0 - 4 (2)        | 0.00E+00 | 0.00E+00 |
| Residential / All   | PCi/g | 0 - 10 (2)       | 0.00E+00 | 0.00E+00 |
| Residential / Groundwater                                       | PCi/g | 12 - 32.4 (2, 3) | 2.6E+00  | 1.52E-01 |

#### Assumptions:

The assumed maximum depth of contamination (i.e., 9.9 m [32.4 ft]) is based on positive detections of COPCs in the vadose zone no deeper than 9.9 m (32.4 ft). It is assumed that COPCs will not migrate downward beyond 9.9 m (32.4 ft) due to the presence of basalt at 9.9 m (32.4 ft).

#### Notes:

- Exposure point concentrations shown for this depth interval represent the 95% lognormal UCL (95 UCL) or maximum detected concentration, whichever is less, for analytical data collected at the site.
- Exposure point concentrations (EPC) shown for this depth interval represent volume-weighted concentrations, and are calculated using the following equations:

| Depth (ft) | EPC Equation   |
|------------|--|
| 0-4        | $[(C_{0-0.5})(0.5) + (C_{0.5-4})(3.5)]/4$  |
| 0-10       | $[(C_{0-0.5})(0.5) + (C_{0.5-4})(3.5) + (C_{4-10})(6)]/10$                         |
| 0-32.4     | $[(C_{0-0.5})(0.5) + (C_{0.5-4})(3.5) + (C_{4-10})(6) + (C_{10-32.4})(22.4)]/32.4$ |

Where: C=95 UCL or maximum detected concentration, whichever is less, for the indicated depth interval.

**Figure 4-17.** OU 4-08: CFA-08 Sewage Treatment Plant nature and extent assumptions.

The primary structures at the treatment plant were constructed below the surrounding grade, approximately 3m (10 ft). In addition, some of the piping for the plant is below this level. Samples were collected in 1996 in the vicinity of the treatment plant at depths ranging from 3.7 to 8.3m (12 to 27.25 ft) to determine if leakage of effluent had occurred from the structures and piping which would have caused migration of potential contaminants from the plant. The analytical data from the samples indicate that soils overlying the basalt at a depth of 8.3m (27.25 ft) are contaminated with Ra-226, and U-235. Although, actual basalt depths range from 6.1 to 9.9m (20 to 32.4 ft), the assumed depth for the risk assessment is 9.9m (32.4 ft). This assumption ensures that potential risks are not underestimated because the volume of contaminated soil is greater than actual.

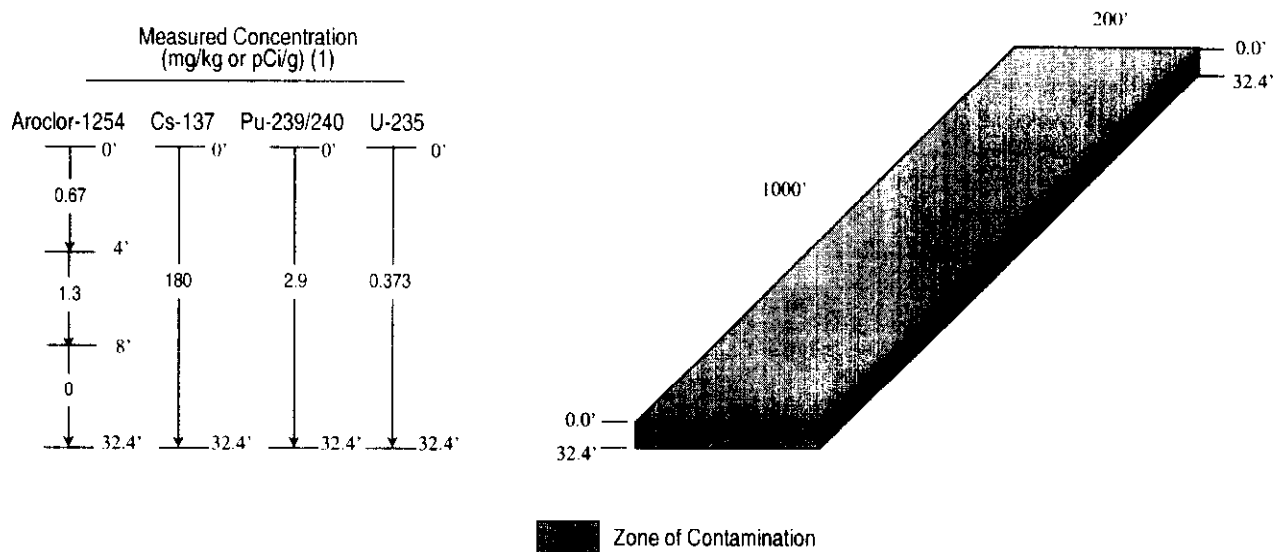
The extent of contamination is assumed to encompass the sewage treatment plant (approximately 5,566 m<sup>2</sup> [59,918 ft<sup>2</sup>]), although contaminants were not found near or outside the STP based on D&D sampling taken during the summer of 1997. This encompasses sample analytical results from a manhole adjacent to the sewage plant (CFA-49). The volume of soil associated with the contamination at the CFA-08 STP is 42,302 m<sup>3</sup> (56,034 yd<sup>3</sup>) (Figure 4-18) (Evans et al. 1995). The summary statistics for the CFA-08 STP COPCs, based on the contaminant screening process are shown in Tables C-30 and C-31, Appendix C. Figure 4-18 shows the assumptions for the nature and extent of contamination.

#### **4.1.11 OU 4-09: CFA-10 Transformer Yard Oil Spills**

**4.1.11.1 Site Summary.** CFA-10 is the site of possible PCB spills from storage of electrical transformers and of wastes disposed to the ground from welding shop operations. CFA-10 is a fenced yard area located adjacent to Building CFA-667, which was used as a welding shop from approximately 1958 to 1985 (see Figure 4-19). Waste from the welding shop may have included small amounts of solvents, along with chromium, cadmium, lead, zinc, and nickel. Process knowledge indicates that the CFA-10 yard was not used to routinely dispose waste, although some accidental spills of solid metals may have occurred. From 1985 to 1990, a 6.1 m (20 ft) wide by 20 m (65 ft) long concrete pad at the site was used as a temporary storage location for transformers, which may have contained PCBs, although there were no documented or suspect leaks or spills from the transformers (Gianotto et al. 1996).

**4.1.11.2 Previous Investigations.** A radiation survey performed at CFA-10 in 1991 detected no radiological activity in the surface soil. The Track 2 investigation focused on characterization of contamination caused by metals and PCBs (Gianotto et al. 1996). Six surface soil samples (0–0.15 m [0–0.5 ft] bgs) were collected for PCB analysis. All positive detections of PCBs were below 2 mg/kg, which is less than the Toxic Substances Control Act (TSCA) PCB screening concentration of 25 mg/kg for industrial sites. Four surface soil samples were collected for metals analysis (see Figure 3-2). Lead and arsenic were detected at levels above background concentrations. The Track 2 decision statement indicated that CFA-10 should be retained for further evaluation in the OU 4-13 RI/FS using the Track 2 investigation data. Data were collected in 1998 from 4 additional locations (see Figure 3-2) to determine the hazardous waste status of the soils using TCLP analysis. Samples were collected at four locations and analyzed for total lead and TCLP lead.

**4.1.11.3 Nature and Extent of Contamination.** An initial contaminant screening was performed in the OU 4-13 Work Plan using the Track 2 data. This screen identified the following contaminants as COPCs: arsenic, lead, Aroclor-1254, and Aroclor-1260. The results of the supplemental contaminant screen conducted as part of this RI/BRA (Table C-33, Appendix C) indicate lead, Aroclor-1254, and Aroclor-1260 are retained as COPCs for further evaluation in the BRA. Detected concentrations of arsenic are not source related and are assumed to be within the range of background concentrations for INEEL soils. Arsenic is therefore eliminated as a COPC. The other contaminants were eliminated from further evaluation.



| Receptors/Pathways and Calculated Exposure Point Concentrations |                |              |          |            |          |              |
|---|----------------|--------------|----------|------------|----------|--------------|
| Receptor/Pathway  | Units          | Depth (ft)   | Cs-137   | Pu-239/240 | U-235    | Aroclor-1254 |
| Occupational / Air  | mg/Kg or PCi/g | 0 - 0.5 (1)  | 1.69E+02 | 2.90E+00   | 2.21E-01 | 6.70E-01     |
| Occupational / External Radiation                               | mg/Kg or PCi/g | 0 - 4 (2)    | 1.79E+02 | 4.24E-01   | 3.44E-01 | 6.70E-01     |
| Residential / All   | mg/Kg or PCi/g | 0 - 10 (2)   | 8.89E+01 | 1.70E-01   | 2.22E-01 | 7.88E-01     |
| Residential / Groundwater                                       | mg/Kg or PCi/g | 0 - 32.4 (2) | 2.74E+01 | 5.23E-02   | 1.49E-01 | 2.43E-01     |

#### Assumptions:

The assumed maximum depth of contamination (i.e., 9.9 m [32.4 ft]) is based on the conservative assumption that downward migration of contamination has contaminated the soil column from the maximum sampling depth at 8.3 m (27.25 ft) down to the basalt interface.

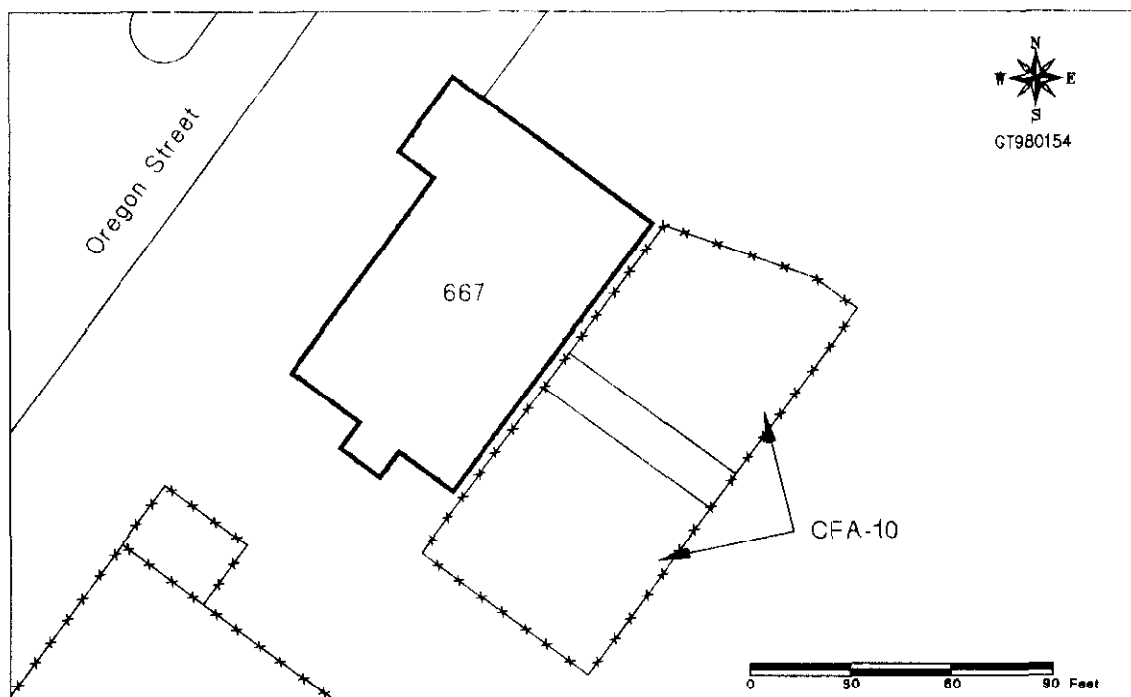
#### Notes:

- Exposure point concentrations shown for this depth interval represent the 95% lognormal UCL (95 UCL) or maximum detected concentration, whichever is less, for analytical data collected at the site.
- Exposure point concentrations (EPC) shown for this depth interval represent volume-weighted concentrations, and are calculated using the following equations:

| Depth (ft) | EPC Equation   |
|------------|--|
| 0-4        | $[(C_{0-0.5})(0.5) + (C_{0.5-4})(3.5)]/4$                  |
| 0-10       | $[(C_{0-0.5})(0.5) + (C_{0.5-4})(3.5) + (C_{4-10})(6)]/10$ |
| 0-32.4     | $C_{>10'}$   |

Where: C=95 UCL or maximum detected concentration, whichever is less, for the indicated depth interval.

**Figure 4-18.** OU 4-08: CFA-08 Drainfield nature and extent assumptions.



**Figure 4-19.** OU 4-09: CFA-10 Transformer Yard Oil Spills.

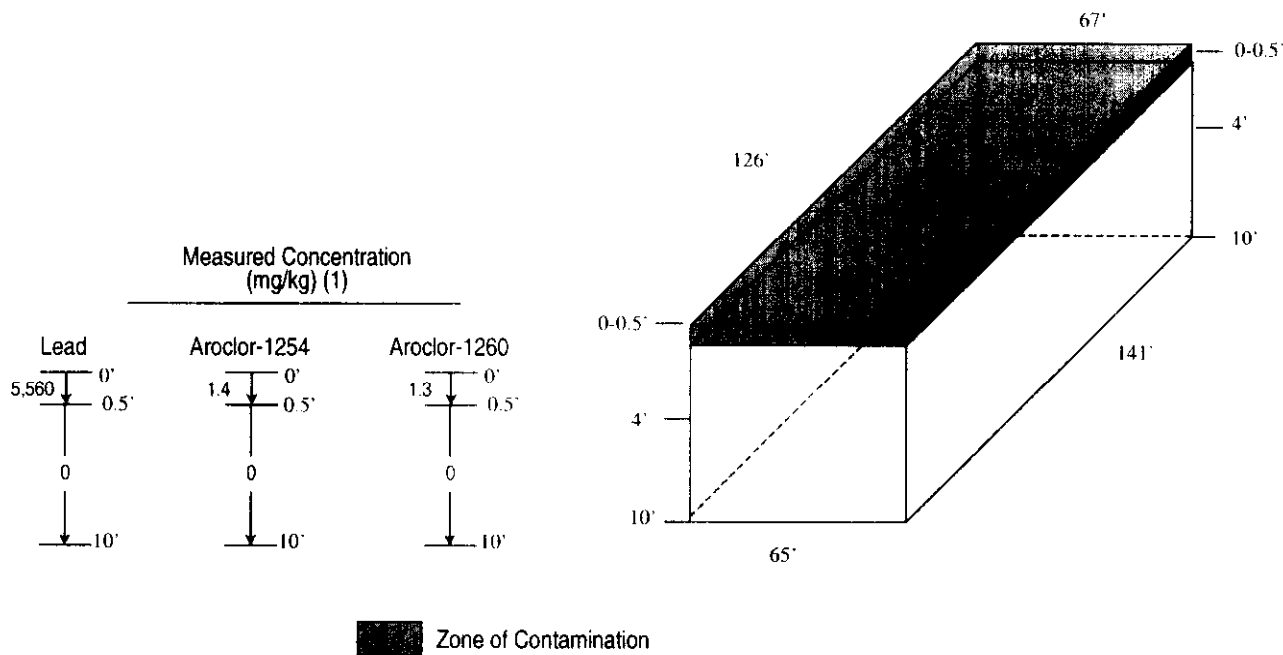
Analytical data collected during 1997 and 1998 (a total of 8 locations) indicate that the surface soils to 0–0.15 m (0–0.5 ft) bgs at CFA-10 are contaminated lead (see Tables C-34 and C-35, Appendix C) in concentrations ranging from 16.5 to 5,560 mg/kg. The full extent of contamination is possibly greater than just these locations because no specific pattern of welding activities or waste disposal of scrap lead in the yard could be identified. For risk assessment purposes, a depth of 0 to 3.05 m (0–10 ft) bgs is assumed for evaluation of residential exposure pathways. Therefore, it is assumed that the full area of the yard (808 m<sup>2</sup> [966 yd<sup>2</sup>]) (Figure 4-20) is contaminated to a depth of approximately 3.05 m (10 ft). The depth of contamination is assumed to be limited to the soil surface (less than or equal to 0.15 m (0.5 ft). Downward migration is not assumed to occur based on previous removal actions at OU 4-06, for which the depth of contaminant migration was shown to be limited to the surface soil, where contaminated soil was removed. The source-term volume is 2,463 m<sup>3</sup> (3,222 yd<sup>3</sup>) of lead-contaminated soil, based on the above assumption (see Figure 4-20).

#### **4.1.12 OU 4-09: CFA-26 CFA 760 Pump Station Fuel Spill**

**4.1.12.1 Site Summary.** CFA-26 is the site of a 209,700-L (55,400-gal) potential loss of diesel fuel. The 227,600 L (55,000 gal) above-ground storage tank was constructed in 1950 and removed in 1986. The loss of fuel occurred over the period from January to March 1979 and was discovered as a result of tank gauging measurements. The heating system was designed to circulate the fuel oil in the tank through the manifold to keep it warm during the winter. The sump consisted of a square concrete-walled structure approximately 6' × 6' in size with the top of the sump at the ground surface. The floor of the sump, located 1.2 m (4 ft) bgs, was open to the soil/gravel. The heating manifold was accessed through a manhole cover at the ground surface.

The cause of the leak was determined to be a small hole in a steam heating manifold, which was located in a piping sump adjacent to the tank. The leak would have discharged directly to the subsurface soils via the gravel bottom of the sump [1.2 m (4 ft) bgs], over a 3-month period, which would have required a minimum discharge rate of 0.4275 gallons/minute.





| Receptors/Pathways and Calculated Exposure Point Concentrations |       |             |           |              |              |
|---|-------|-------------|-----------|--------------|--------------|
| Receptor/Pathway  | Units | Depth (ft)  | Lead      | Aroclor-1254 | Aroclor-1260 |
| Occupational / Air  | mg/Kg | 0 - 0.5 (1) | 5.560E+03 | 1.40E+00     | 1.30E+00     |
| Occupational / External Radiation                               | mg/Kg | 0 - 4 (2)   | 7.63E+02  | 1.75E-01     | 1.63E-01     |
| Residential / All   | mg/Kg | 0 - 10 (2)  | 3.05E+02  | 7.00E-02     | 6.50E-02     |

#### Assumptions:

The area of contamination is the area of the site based on process knowledge that there was no specific pattern of waste disposal. The maximum depth of contamination is 0.15 m (0.5 ft) bgs based on analytical data. For purposes of evaluating the future residential scenario, it is assumed that contamination may occur to a depth of 3.05 m (10 ft) bgs as a result of excavation activities.

#### Notes:

- (1) Exposure point concentrations shown for this depth interval represent the 95% lognormal UCL (95 UCL) or maximum detected concentration, whichever is less, for analytical data collected at the site.
- (2) Exposure point concentrations (EPC) shown for this depth interval represent volume-weighted concentrations, and are calculated using the following equations:

| Depth (ft) | EPC Equation   |
|------------|--|
| 0-4        | $[(C_{0-0.5})(0.5) + (C_{0.5-4})(3.5)]/4$                  |
| 0-10       | $[(C_{0-0.5})(0.5) + (C_{0.5-4})(3.5) + (C_{4-10})(6)]/10$ |

Where: C=95 UCL or maximum detected concentration, whichever is less, for the indicated depth interval.

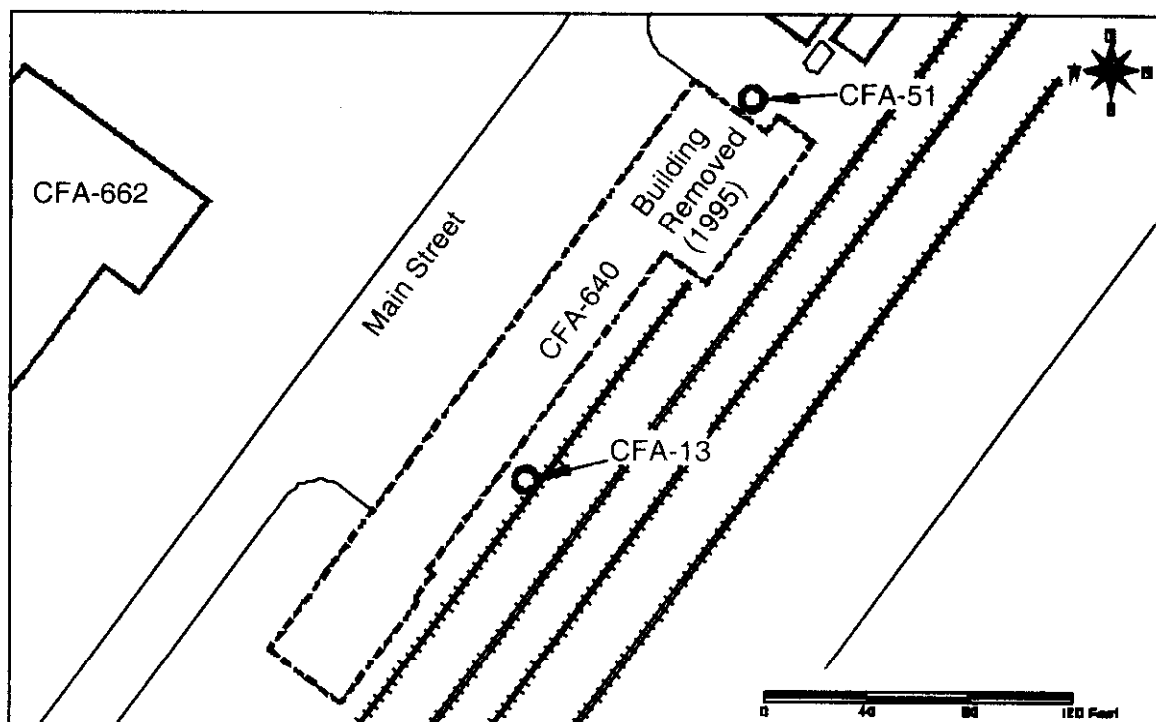
**Figure 4-20.** OU 4-09: CFA-10 nature and extent assumptions.

Integrity tests performed on the tank after the incident revealed that the tank was not the source of leakage. The location of the former tank is now occupied by building CFA-623, the Multicrafts Shop (see Figure 4-21). Interviews with personnel who worked on the foundation construction revealed that diesel fuel odor or stained soil was not noticed during the construction period. The above information indicates that the discharge occurred primarily to the subsurface soil.

**4.1.12.2 Previous Investigations.** A Track 2 investigation was performed at CFA-26 in 1995. The information in Section 4.1.12.2 was gathered during the investigation and prior to field data collection. As a result, subsurface samples were collected from five boreholes at the soil-basalt interface in the vicinity of the former tank. The boreholes were placed as close to the former tank location as possible, however the presence of CFA-623 interfered with borehole placement directly over the former tank or sump location. The depth to basalt, based on these boreholes, ranges from 2.9 to 3.4 m (9.5 to 11.2 ft).

Samples collected from the boreholes were analyzed for VOCs, SVOCs, and TPH. Four of the five samples contained TPH at concentrations below the INEEL screening level of 1,000 mg/kg. The TPH concentration in the fifth borehole was 3,470 mg/kg at a depth of 3.4 m (11.2 ft). Three other contaminants were detected, chlorodifluoromethane (0.1 mg/kg), phenol (0.31 mg/kg), and di-n-butylphthalate (0.49 mg/kg), which were screened from further evaluation in the Work Plan.

**4.1.12.3 Nature and Extent of Contamination.** Data collected during the Track 2 investigation indicate that surface soils to a depth of 3 m (10 ft) are not contaminated and that TPH contamination was detected in the soil at approximately 3 to 4.4 m (10 to 11.2 ft). All contaminants at CFA-26 were eliminated in the contaminant screen in the Work Plan, therefore eliminating a supplemental contaminant screen. However, the potential exists for petroleum contamination in the basalt, consequently, the groundwater exposure pathway to assess cumulative risk to groundwater is evaluated in Section 6.



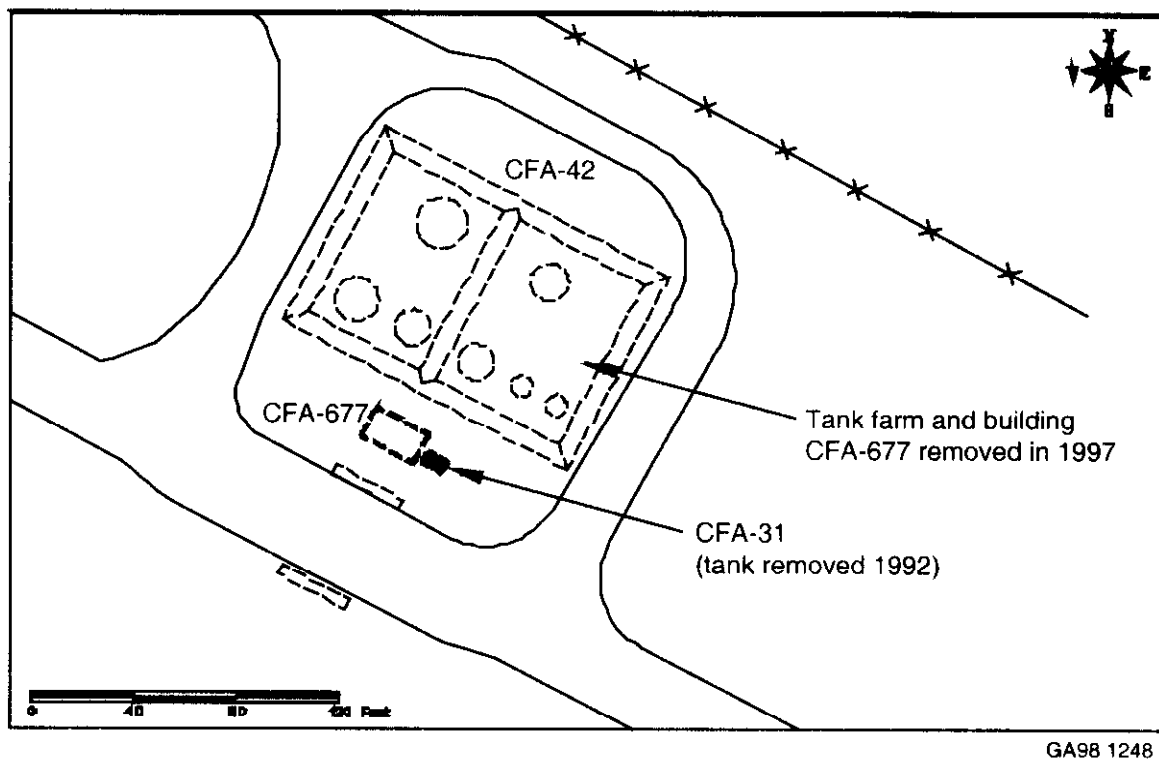
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**Figure 4-21.** OU 4-09: CFA-26 CFA-760 Pump Station Fuel Spill.

#### 4.1.13 OU 4-09: CFA-42 Tank Farm Pump Station Spills

**4.1.13.1 Site Summary.** CFA-42 consists of the area around and beneath the Tank Farm where spills and leaks of unused fuel occurred. The CFA Tank Farm area was constructed in 1950 and deactivated in 1994 (Landis et. al., 1998). It was used for bulk storage of diesel fuel, gasoline, kerosene, and white gas. Two catch basins, located on the south side of Quebec Avenue, were used to receive fuel from bulk tanker trucks to the tanks. The fuel rack, located on the north side of Quebec Avenue, was used for delivery of fuel to fuel trucks that supplied INEEL facilities (see Figure 4-22). Visible soil staining, especially around the catch basins, was the result of occasional small spills of unused fuel during delivery operations. All contaminated soil, piping, tanks, and structures were removed during two removal actions, discussed below.

**4.1.13.2 Previous Investigations.** A Track 2 investigation was conducted in 1995 to determine the extent of contamination in the vicinity of the catch basins and the fuel rack. Excavation around the catch basins indicated the presence of petroleum odors and discoloration. It was concluded that the extent of petroleum contamination was greater than originally estimated. Soil samples were collected from contaminated areas, and the excavation was backfilled. Analytical results from the soil samples collected from the excavation indicate detectable levels of 2-methylnaphthalene, acenaphthene, pyrene, and TPH. The Track 2 risk assessment indicated that the HQ exceeded 1.



**Figure 4-22.** OU 4-09: CFA-42 Tank Farm Pump Station Spills.

A time-critical removal action was conducted in June 1996 to remove petroleum-contamination on the west side of Quebec Avenue to concentrations below 1,000 mg/kg (Landis et. al., 1998). The catch basins and associated piping were removed along with 1,797 m<sup>3</sup> (2,350 yd<sup>3</sup>) of contaminated soil down to the top of basalt, approximately 7.6 m (25 ft) bgs. The soil was treated at the INEEL Landfarm.

Verification samples were collected from the face and bottom of the excavation. Data indicated that TPH contamination was less than 1,000 mg/kg. While the removal action accomplished the goal to remove TPH contaminated soil to below 1,000 mg/kg the full extent of contamination beneath the Tank Farm was not determined. The possibility existed that TPH contamination could be present beneath the north fuel rack and the bulk fuel tanks at concentrations greater than 1,000 mg/kg.

Based on a review of the Track 2 and removal action information, the extent of contamination was considered a data gap. This site was therefore retained for further evaluation in the OU 4-13 RI/BRA.

Prior to any demolition activities at CFA-42, it was necessary to perform both lead analysis and asbestos analysis on the pump house and the fuel tanks. Lead paint was found to be present on the tanks and above-ground piping. This material was disposed of in the CFA Landfill.

Demolition activities began July 29, 1997 with removal of pumps and piping in and around the pump house and fill station. This also meant draining the fuel systems prior to any demolition efforts. The residual fuels were stored in 208 L (55 gal) drums prior to disposal. There were 5 total drums, one each for the following: unleaded gasoline, fuel oil, diesel #1, diesel #2, and mixed diesel #1 and #2. The residual fuel was placed in a UST used for petroleum product storage. This UST was used as a fuel source for the boiler at CFA. After the pumps and associated piping were removed from CFA-42, the pump house and fill station were demolished and taken to the CFA Bulky Waste Landfill for disposal. After the pump house and piping were removed, the demolition of tanks began. The tanks were cut up and taken to CFA warehouse for recycling.

Excavation activities began on August 18, 1997. Because the soil was dark gray and moist in appearance with a strong petroleum odor, the excavation followed visual and odor observations, as well as PID readings. The excavated soil was loaded into dump trucks, weighed, and transported to the CFA Landfarm for treatment. The total amount of contaminated soil removed from the area was 4,921 m<sup>3</sup> (6,437 yd<sup>3</sup>).

As excavation continued, the contamination was observed to extend horizontally in all directions from the fill station area. Consequently, a section of Quebec Avenue was removed. Soil with low PID readings was stockpiled south and east of the excavation on a tarp to be used as backfill. Additional backfill material was obtained from the CFA gravel pit. Soil used for topsoil was obtained from the Spreading Area "B."

Confirmation samples were collected prior to backfilling this excavation. These samples are used to evaluate the current nature and extent of contamination at CFA-42. The initial contaminant screen presented in the RI/FS Work Plan identified 2-methylnaphthalene and phenanthrene as COPCs at CFA-42. The results of the supplemental contaminant screen, presented in Table C-36, Appendix C, indicate that phenanthrene should be retained for further evaluation in the RI/BRA. Phenanthrene was detected in 4.8 percent of 42 samples (0.00428 and 0.0157 mg/kg) at 20 ft bgs, which is in the basalt.

Post removal action samples did not include 2-methylnaphthalene. There is a high likelihood that the 2-methylnaphthalene contamination was removed along with the site's other contaminants, but removal of all of the 2-methylnaphthalene contamination was not confirmed by the post-removal action

sampling. The potential impacts of contamination that was not detected by sampling are discussed in Section 6.5.

**4.1.13.3 Nature and Extent of Contamination.** Measured concentrations indicate that subsurface soils (6.1 m [20 ft] bgs) at CFA-42 are contaminated with low levels of phenanthrene. During the 1997 removal action, basalt was encountered at depth ranging from 6.1 to 7.3 m (20 to 24 ft) bgs. Because soils at CFA-42 have been remediated to the surface of basalt and the area backfilled with clean soil from the Quebec Avenue excavation and the CFA gravel pit, the residual contamination is assumed to occur in the basalt.

The extent of the contamination is assumed to encompass the entire site (approximately 83.6 m<sup>2</sup> [100 yd<sup>2</sup>]). For purposes of assessing cumulative risk to groundwater, the thickness of contamination is assumed to be 0.15 m (0.5 ft) deep beneath the backfill. Therefore, the volume of soil associated with the contamination at CFA-42 is 12.54 m<sup>3</sup> (450 ft<sup>3</sup>) (Figure 4-23) (Gianotto et al. 1996). The summary statistics for phenanthrene are shown in Tables C-37 and C-38, Appendix C. Figure 4-23 shows the assumptions for the nature and extent of contamination and source-term estimates (i.e., exposure point concentrations) that are used to evaluate potential risks associated with the site. Evaluation of potential risks from phenanthrene will be limited to residential groundwater exposure pathways because phenanthrene-contaminated soil occurs at depths greater than 3.6 m (12 ft) bgs.

#### **4.1.14 OU 4-09: CFA-46 Cafeteria Oil Tank Spill (CFA-721)**

**4.1.14.1 Site Summary.** CFA-46 is the site of a diesel fuel leak from an 18,927-L (5,000-gal) underground fuel storage tank (CFA-721) (Figure 4-24). The tank was installed in 1963 and removed in September 1994. The tank, associated piping, and an estimated 229 m<sup>3</sup> (300 yd<sup>3</sup>) of contaminated soil were removed during excavation. The excavation extended to basalt, which was encountered at 4.9 m (16 ft) bgs. The contaminated soil was treated at the CFA landfarm and the piping was disposed at the CFA Landfill. The basalt appears to be contaminated but has not been sampled; consequently, the concentrations and volume of COPCs are not known (Gianotto et al. 1996).

**4.1.14.2 Previous Investigations.** Data and other information presented in this section are from the tank removal operation. Two soil samples were collected from the bottom of the excavation (4.9 m [16 ft] bgs) and analyzed for TPH. Seven additional soil samples were collected from six locations at the site, before the excavation was backfilled. Analysis was performed for benzene, toluene, ethylbenzene, and xylenes (BTEX). The contaminant screen presented in the RI/FS Work Plan initially identified BTEX and diesel-range TPH (TPHd) as COPCs.

**4.1.14.3 Nature and Extent of Contamination.** The supplemental contaminant screen for CFA-46, presented in Table C-39, Appendix C, indicates that the levels of BTEX and TPH, identified in the Work Plan as COPCs, are below screening levels (see Table C-40 for summary statistics). However, because the depth of contamination at CFA-46 is greater than 3 m (10 ft), the site is retained for evaluation of cumulative risk associated with the groundwater pathway.

#### **4.1.15 OU 4-11: CFA-05, Motor Pool Pond**

**4.1.15.1 Site Summary.** The CFA-05 Motor Pool Pond consists of an unlined evaporation pond located in an abandoned borrow pit approximately 3,656 (12,000 ft) east of the CFA Equipment Storage Yard (see Figure 4-25). The site includes the sediments of the pond, sediments along the inlet ditch, and at the discharge pipe. The pond received wastes from the wash bay and outside sumps at the Service.